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Managing carious lesions: why do we need consensus on terminology and clinical recommendations on carious tissue removal?

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Running title: Consensus on caries terminology and carious tissue removal

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Although the prevalence of dental caries has decreased in many countries over the last three decades, it remains one of the most prevalent diseases worldwide, burdening billions of people (Marcenes et al. 2013) and generating significant global healthcare costs (Listl et al. 2015). How to manage carious lesions best is, therefore, a central concept in oral health care. The management should be guided by evidence-based recommendations, founded on agreement between professionals, easing clinical decision-making. Whilst the number of studies to support guidance is growing (Ricketts et al. 2013), there is disagreement around how to interpret the existing data. One of the underlying reasons for this disagreement is the use of different terms for describing more or less the same management strategies. There also continues to be a gap between research findings and clinical practice. The reasons for this are complex but contributing factors are inconsistencies in clinical guidelines, dental education, national healthcare policies and remuneration systems. To tackle these issues and provide a stepping-stone from which to improve management of carious lesions, the International Caries Consensus Collaboration (ICCC) compiled expert consensus on terminology and recommendations for dealing with carious tooth tissue removal and managing cavitated carious lesions. The ICCC comprised 21 experts in cariology from 12 countries covering North and South America, Eastern and Western Europe, Asia and Australasia.

In keeping with accepted consensus methodology (Black et al. 1999) the structure of the group, process of agreement and methodology were made explicit from the outset. A three-step process preceded a meeting of ICCC in Leuven, Belgium in February 2015. Firstly, key sessions for the conference were drafted, abstracted and aligned, and international experts in those areas prepared and led each session:

1. Lars Bjørndal, Copenhagen, Denmark: "Caries - a mistaken disease (key aspects: histological zones of dental caries, mapping of clinical and histological appearances, measuring extent of carious tissue removal and residual carious lesions);
2. Nicola Innes, Dundee, Scotland: "Many options, many names – what do we have so far?" (key aspects: terminology of carious tissue removal, carious tissue removal

processes/protocols, definitions; aims of different methodologies; stage of certainty around outcomes for each);

3. Wolfgang Buchalla, Regensburg and Falk Schwendicke, Berlin, Germany: Methods and criteria for carious tissue removal (key aspects: available criteria and methods, laboratory and clinical evidence supporting these methods and criteria);
4. David Ricketts, Dundee: Managing caries by carious tissue removal – why do we drill and what good does it do? (key aspects: the idea of carious tissue removal, what we do when using different criteria or strategies for carious tissue removal, the clinical evidence for these strategies, a proposed decision framework);
5. Marisa Maltz, Porto Alegre, Brazil: How to proceed – treating the cavity floor and cavity disinfection? (key aspects: cavity liners and the laboratory, pre-clinical and clinical evidence supporting their use, interaction between lining and restoration materials, liners after different carious tissue removal strategies, cavity disinfection, effect of cavity disinfection versus effect of cavity sealing, the clinical efficacy of cavity disinfection); and
6. Kirsten van Landuyt, Leuven, Belgium: Why we've covered all this – restoring excavated teeth (key aspects: physic-chemical behavior of physiologic and pathologic dental hard tissue, test methods for evaluating restorative dentistry and their validity, adhesive strategies for different substrates, different materials for restoring extended cavities and their suitability in proximity to pulp, application techniques and their practical feasibility under various clinical and environmental conditions).

The evidence-guided pre-conference report was prepared by the rapporteurs on their topic and disseminated among the collaboration for review and comment. These comments were compiled, commented on, in return, by the rapporteur, and again re-distributed. The second round again asked for agreement and disagreement, and responses were again compiled.

These documents formed the basis for the second part of the process, the conference, with the rapporteurs presenting a 20-30 min talk on each topic. After each topic, the ICCC members discussed where there was adequate evidence and consensus to be funneled into

an agreement. These statements were compiled for a final roundtable discussion. The third part of the process involved two manuscripts being prepared based on these discussions and a transcript of the meeting. These were distributed again, comments collated and re-circulated over two rounds. Weak or strong levels of endorsements, for or against different treatments were assigned to each recommendation based on the degree of evidence quality and quantity i.e. level of certainty. These were ascribed through consensus. One member of the group decided to not support the emerging consensus; two members stated their willingness *a priori* to facilitate discussions and lend their expertise and experience, but not to share authorship of the resulting consensus documents.

The resulting two manuscripts presented in this issue of *Advances of Dental Research* lay out the ICCC group's agreement on terminology towards, and clinical recommendations for, managing carious tissue removal and cavity management including restoration (Innes et al. 2016; Schwendicke et al. 2016). They should not be considered an attempt to end discussion, but rather act as a starting point. Therefore, we welcome comment and discussion on the manuscripts' contents and hope that colleagues will consider using the agreed recommendations on terminology and carious tissue removal so that they become standard in clinical practice, teaching and research, easing communication and reading of the literature. We hope that through driving towards appropriate care these recommendations help to improve the oral health of people by reducing the extremely high burden of the result of dental caries, in the years to come.

Authors contribution

All authors initiated and organized the consensus process, wrote the initial draft of the manuscript, read, amended and approved the manuscript.

Declaration of Interests

The corresponding author formally requested a declaration of possible conflicts of interest from each of the consensus conference members. We declare there were no commercial conflicts of interest within the consensus process and writing of this document and no companies or their members participated in the process or saw the manuscript before finalisation. For the purposes of transparency we have listed a comprehensive declaration of interests: AS – none;

AZ – paid lectures, ICDAS Foundation member; AB – commercial grant: GSK, 3MESPE, paid lectures: 3MESPE, GC, Septodont, Colgate, OralB; CS – none; DM – commercial grants: GC, paid lectures: GC, DMG; DR – none; EL – none; FS – commercial grant: DMG, GC, paid lectures and consultancy work: DMG; GC – none; JF – paid lectures: 3MESPE India and GC America; KvL – none; LB – none; MF – none; MM – none; NI – commercial grant: 3MESPE (2001), paid lectures: 3MESPE, Colgate; SD – none; SL – paid lectures: GC; VM – none.

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